Measures of Dispersion

Exercise 2C

1. The daily mean pressure (hPa) during the last 16 days of July 2015 in Perth is recorded. The data is given below:

   1024 1022 1021 1013 1009 1018 1017 1024
   1027 1029 1031 1025 1017 1019 1017 1014

   (a) Find the median pressure for that period.
   (b) Find the lower and upper quartiles.

2. Rachel records the number of CDs in the collections of students in her year. The results are in the table below.

Number of CDs	35	36	37	38	39
Frequency	3	17	29	34	12

   Find Q_1, Q_2 and Q_3.

Exercise 2E

1. Given that for a variable x: $\Sigma x = 24$ $\Sigma x^2 = 78$ $n = 8$
   Find:
   (a) the mean
   (b) the variance σ^2
   (c) the standard deviation σ

2. Ten collie dogs are weighed (w kg). The summary data for the weights is:
   $\Sigma w = 241$ $\Sigma w^2 = 5905$
   Use this summary data to find the standard deviation of the collies' weights.

3. Eight students' heights (h cm) are measured. They are as follows:
   165 170 190 180 175 185 176 184
   (a) Work out the mean height of the students.
   (b) Given $\Sigma h^2 = 254307$ work out the variance. Show all your working.
   (c) Work out the standard deviation.

4. For a set of 10 numbers: $\Sigma x = 50$ $\Sigma x^2 = 310$
   For a different set of 15 numbers: $\Sigma x = 86$ $\Sigma x^2 = 568$
   Find the mean and standard deviation of the combined set of 25 numbers.

5. Nahab asks the students in his year group how much pocket money they get per week. The results, rounded to the nearest pound, are shown in the table.

Number of £s	8	9	10	11	12
Frequency	14	8	28	15	20

   (a) Use your calculator to work out the mean and standard deviation of the pocket money. Give units with your answer.
   (b) How many students received an amount of pocket money more than one standard deviation above the mean?

6. In a student group, a record was kept of the number of days of absence each student had over one particular term. The results are shown in the table.

Number of days absent	0	1	2	3	4
Frequency	12	20	10	7	5

   Use your calculator to work out the standard deviation of the number of days absent.

Exercise 20B

1. For each set of data, calculate the standard deviation and interquartile range. Use the formula first, then use statistical functions on your calculator to check your answer.
   (a) (i) 19.0, 23.4, 36.2, 18.7, 15.7 (ii) $0.4, -1.3, 7.9, 8.4, -9.4$

   (b) (i) 28, 31, 54, 28, 17, 30 (ii) 60, 18, 42, 113, 95, 23

   (c) (i) 1, 2, 1, 3, 5 (ii) $3, -2, 4, -2, 5, 2$

2. Sets of data are summarised by the information given. For each set of information find the standard deviation.
   (a) (i) $\Sigma(x-\bar{x})^2 = 42.9, n = 10$ (ii) $\Sigma(x-\bar{x})^2 = 8.9, n = 10$

   (b) (i) $\Sigma x = 49, \Sigma x^2 = 339, n = 8$ (ii) $\Sigma x = 329, \Sigma x^2 = 22135, n = 8$

   (c) (i) $\bar{x} = 66.6, \overline{x^2} = 4512.6$ (ii) $\bar{x} = 24.8, \overline{x^2} = 1072.4$

3. The interquartile range of the ordered set of data $5, 5, 7, 8, 9, x, 13$ is equal to 7.
   (a) Find the value of x.
   (b) Find the standard deviation of the data set.

4. Ten data items have a sum of 468 and the sum of the squares of the data is 27172.
   (a) Find the mean of the data.
   (b) Find the variance of the data.

5. The speed, x, in mph, of 10 serves by Tim, a professional tennis player, is summarised as: $\Sigma x = 1245, \Sigma x^2 = 156403$.
   (a) Find the mean speed of the serves.
   (b) Find the standard deviation of the speed of the serves.

7. Consider the five numbers: 2,5,9, x and y. The mean of the numbers is 5 and the variance is 6. Find the value of xy.

8. The mean of a set of 15 data items is 600 and the standard deviation is 12. Another piece of data is discovered and the new mean is 600.25. Find the new standard deviation.

9. The mean IQ of a class of 9 students is 121 and the variance is 226.
   Another student joins the class and the variance changes to 239.4.
   What are the possible values of the IQ of the new student?

Answers

Exercise 2C

1 **(a)** 1020 hPa
(b) $Q_1 = 1017$ hPa, $Q_3 = 1024.5$ hPa

2 Median 37, $Q_1 = 37$, $Q_3 = 38$

Exercise 2E

1 **(a)** 3 **(b)** 0.75 **(c)** 0.866

2 3.11 kg

3 **(a)** 178cm **(b)** 59.9cm^2 **(c)** 7.74 cm

4 Mean 5.44, standard deviation 2.35

5 **(a)** Mean £10.22, standard deviation £1.35
(b) 19

6 1.23 days

Exercise 20B

1 **(a)** **(i)** $\sigma = 7.23$ IQR=12.6
(ii) $\sigma = 6.57$ IQR=13.5
(b) **(i)** $\sigma = 11.1$ IQR=3
(ii) $\sigma = 35.3$ IQR=72
(c) **(i)** $\sigma = \frac{\sqrt{56}}{5}$ IQR=3
(ii) $\sigma = 2.75$ IQR=6

2 **(a)** **(i)** 2.07 **(ii)** 0.943
(b) **(i)** 2.20 **(ii)** 32.8
(c) **(i)** 8.78 **(ii)** 21.4

3 **(a)** 12 **(b)** 2.92

4 **(a)** 46.8 **(b)** 527

5 **(a)** 124.5 mph **(b)** 11.8 mph

7 18

8 11.7

9 101 or 141